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ABSTRACT

Part of a series of industrial arts curriculum materials developed by the State of Louisiana, the tentative curriculum guide presents an outline for an introductory course on the construction industry. Designed for use at the middle school level, it is intended that through the performance of the suggested activities, student knowledge of work and career opportunities in the construction industry will be increased. The four major topic outlines include: an introduction; managing construction; applying technology to people; and construction production technology. Performance objectives and suggested activities are presented for each topic. Suggested resources are provided for the implementation of the activities. Each resource is coded to match the list of resource materials that completes the document. (NJ)

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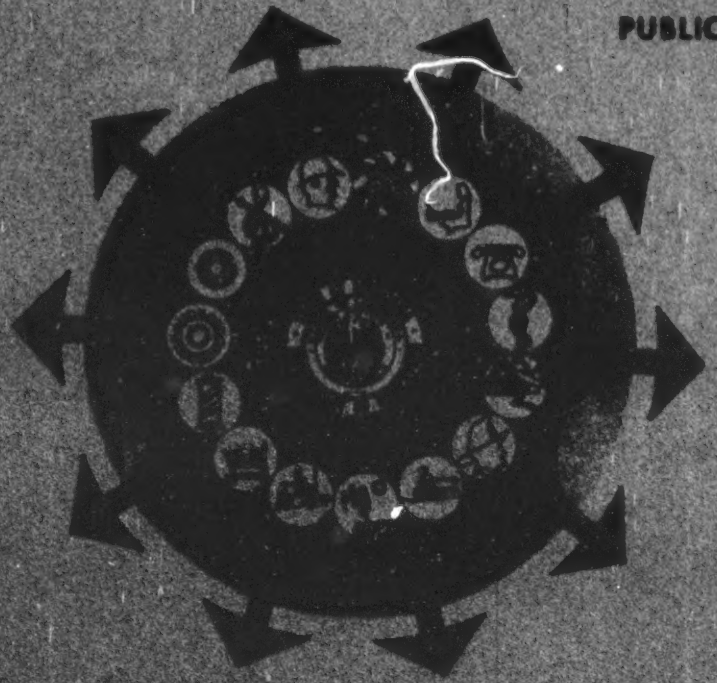

INDUSTRIAL ARTS CURRICULUM GUIDE

MIDDLE SCHOOLS 6-9

CONSTRUCTION

1974

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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CONSTRUCTION

Overview

Upon completion of the course the student will be able to identify that part of the world was built by the Construction Industry. The student will perform activities that relate to the many conveniences enjoyed and often taken for granted by man in today's society along with the ability to relate and solve the problems that may arise between Labor and Management. The student will be able to identify and demonstrate a working knowledge of what Construction personnel do and the career opportunities available in the Construction Industry.

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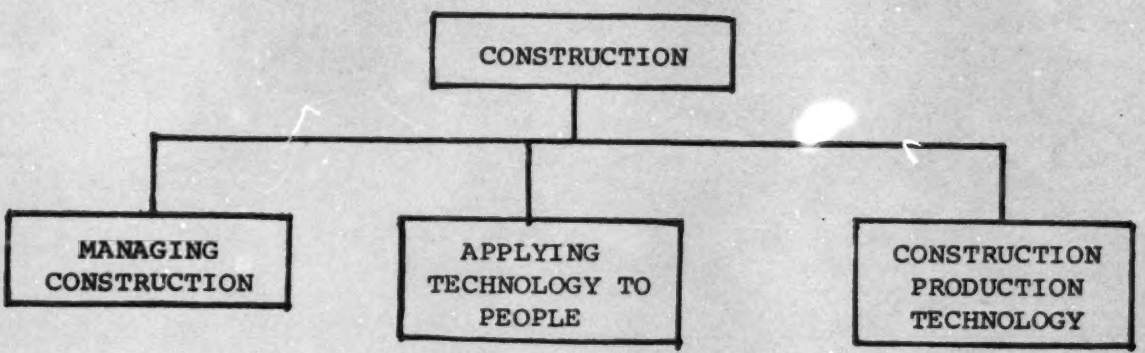
CONSTRUCTION
MANAGING CONSTRUCTION
APPLYING TECHNOLOGY TO PEOPLE
CONSTRUCTION PRODUCTION TECHNOLOGY

3-2

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
I. Introduction A. Man and Technology	Students will be able to discuss the following topics. A. The dawn of man B. The beginning of an economic system C. Processing Economic Goods 1. Extracting Economic Goods 2. Natural from nature 3. Construction 4. Manufacture D. Industry Students will be able to record, examine and compare efficiency in relation to time and cost per hole using time and cost charts.	Instructor will explain and demonstrate drilling process to be followed and supervise the drilling of three holes in each board using three types of drills by the students. Students will drill holes in a piece of wood with an electric drill, a hand drill and a bow drill.	(1) page 51 (2) Ch. 1 (3) page 9
B. Construction Technology	A. Beginning of Construction Technology B. Construction Technology today C. Construction Technology in the future D. How Construction Technology is achieved	The instructor will show students film on the world of construction.	(1) page 51 (2) Ch. 2 (3) page 11

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
	E. Elements of Construction Technology 1. Management technology 2. Personnel technology 3. Production technology Students will be able to explain and give examples of construction technology and classify them as to management, personnel and production technology.	Instructor will explain and give examples to students the managing activities related to construction so that the students may better discuss this activity in the form of a game.	
II. Managing Construction	A. Management Activity is universal B. Management in Construction 1. Planning a. Formulating b. Researching c. Designing d. Engineering 2. Organizing a. Forming b. Monitoring c. Correcting d. Reporting C. Many persons perform management activities	Instructor will explain and give examples to students the managing activities related to construction so that the students may better discuss this activity in the form of a game.	(1) page 51 (2) Ch. 4 (3) page 16

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
	Students will be able to relate and discuss the management, organizing and controlling activities related to construction and answer the following questions: 1. What is to be constructed and why? 2. How does the construction contractor organize and supply his system with tools, materials, and personnel? 3. Who will direct the construction of this project?		
A. Beginning the Project	Students will be able to answer the following questions: 1. Who is an initiator? 2. What is meant by feasibility? 3. Name some people or groups of people who may be classified as initiators. a. Financial Consultants b. Management Consultants c. Technical Consultants d. Public Relations Consultants	Students, acting as professional consultants, identify some basic problems that exist in their community and recommend a solution. The students, acting as a city planning commission, select a community project to be supported and develop the publicity for the project.	(1) page 52 (2) Ch. 5 (3) page 20

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
1. Selecting a Site	The student will be able to give solutions to problems in selecting a site such as cost, location, climate, soil, and zoning.	Instructor will identify available sites on an illustration of potential construction sites in a community. Using a table of site feasibility of each site as a potential construction site. Students select a site for the project, and write their reasons for their selection.	(1) page 52 (2) Ch. 6 (3) page 22
2. Buying Real Estate	Students will be able to discuss the following topics: A. History of land holdings 1. Grants 2. Parcels or Tracts B. Records 1. Boundries 2. Legal Descriptions 3. Plats C. Titles and Surveys D. Change of Ownership	Explanation by instructor and exhibit of sample deeds and title abstracts.	(1) page 52 (2) Ch. 7 (3) page 24
3. Surveying and Mapping	Students will be able to level and improvised alidade to simulate actual surveying procedure. Student will be able to draw profile chart from topographic map.	Instructor will demonstrate and have students measure elevation with a stadia rod. Record elevation data on a grid sheet. Draw contour lines by	(1) page 52 (2) Ch. 8 (3) page 28

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
	Students will be able to discuss the following topics: 1. Land Surveys 2. Topographic Surveys 3. Route Surveys 4. Hydrographic Surveys 5. Aerial Surveys 6. Construction Surveys B. Research 1. Finding Known points C. Location Surveys 1. Transit 2. Level 3. Plane Table D. Survey Parties E. Elevation Surveys 1. Levels 2. Surveying altimeter 3. Elevation meter F. Plotting Data	connecting all recorded elevations of the same height. Using a topographic map showing a proposed highway route, plot the profile of the land surface along the length of the highway route and along a cross section.	
4. Soil Testing	Student will be able to demonstrate procedure for testing soil and compare compressibility of two types of soil.	Analyze two soil samples, clay and sand, to find out if excavation facing is needed.	(1) page 53 (2) Ch. 9 (3) page 31

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		Test two soils, clay and sand, for water absorption. Analyze the soil strengths of clay and sand. Test and compare the strenght of clay and sand after water has evaporated. Test and compare the compressibility of clay and sand using two tamping techniques.	
B. Designing and Engineering Construction Projects	Student will be able to identify refine, analyze, make decisions and implement the design process, using the following design guides. 1. Function 2. Appearance 3. Cost 4. Construction Materials 5. Strength	Instructor will have students answer what steps are represented in each project described in Lab manual.	(1) page 53 (2) Ch. 10 (3) page 38
	Students will be able to indicate for each project whether the chief designer was an architect an engineer or a combination of both.	After studying illustrations and descriptions of construction projects, students will indicate for each project whether the chief designer was an architect, engineer, or an architect and an engineer.	

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
1. Identifying the Design Problem	Student will be able to list several kinds of data that identify the needs that the following structures will fill. 1. Warehouse 2. Garage 3. School 4. Hospital 5. Factory 6. Department Store	In designing a community park, identify the major needs that the park should meet. List several kinds of data that will help identify the needs. Having the needs and the related data available to them, students will evaluate the data and determine the effect on the design problem.	(1) page 54 (2) Ch. 11 (3) page 41
a. Developing Preliminary Ideas	Students will be able to list ideas for park area and structures and will develop and modify the ideas to best suit the needs	Students will develop preliminary ideas for park areas and structures. Develop preliminary ideas for one of the structures. Instructor will give students an explanation of what is meant by preliminary ideas.	(1) page 54 (2) Ch. 7 (3) page 43
b. Refining Ideas	Students will be able to draw in refined ideas on park or structure sketch.	Draw refined sketch of a location for park areas and structures. Plan the walkways to connect the areas. Using a list of design requirements for the park areas and structures, draw a refined sketch of a structure.	(1) page 54 (2) Ch. 13 (3) page 49

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
2. Analyzing the Design	Students will be able to calculate the grade limits for three types of road materials. Students will be able to demonstrate method of determining amount of counter-balance weight needed for a bascule bridge.	Compute the weight needed to counter-balance a vehicle load on a bridge. Compute the grade limit for roadways made of concrete or blacktop, gravel, and sand, knowing the weight of a vehicle in tons and the pounds of engine pull. Test the computation by constructing and testing a simple road grade. Working with the results from the above activities prepare and present to the class a report of the findings from testing a model bridge counterbalance weight and a model roadway grade limit.	(1) page 54 (2) Ch. 14 (3) page 49-53
a. Selecting the Design	Students will be able to act as a committee member of a design selection committee.	Student Activities Act as a design selection committee. Select the best bascule bridge design for the community park and present the selection to the class. Using design requirements and construction specifications for a roadway design for the community park and present the selection to the class.	(1) page 54 (2) Ch. 15 (3) page 55

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
b. Making Working Drawings	Students will be able to locate and identify such items as location, length, width, and elevations.	Identify the following from a set of contract working drawings: (1) Location of the house (2) Overall length and width of the house and garage (3) Scale of the left, right, and rear elevations (4) Depth of the concrete block foundation wall (5) Roof, detail, and heating plans Using a contour map of a building site, locate, layout, and sketch a structure to scale on a site plan; include compass orientation driveway placement, and dimensioning. Draw the foundation plan from the design requirements for a garage to scale and dimension the drawing. Make a section drawing of a garage foundation to scale, using the design requirements and the appropriate symbols. Draw a foundation plan for a proposed room and porch addition, showing the foundation wall and foundation footing. Locate the	(1) page 55 (2) Ch. 16 (3) page 57-66

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		position of electrical fixtures on a floor plan for a house, using an Electrical Legend and Fixture Schedule. Working from a set of stairway design factors, compute the number of concrete stair risers and treads needed for a given rise, draw the stairs, and use the appropriate symbols to indicate material.	
c. Writing Specifications	Student will be able to complete a plumbing-fixture specification sheet by recording catalog number, description, and cost for each fixture. Complete a door specifications sheet by recording the catalog description catalog number, and cost.	Instructor should exhibit specification sheets and give example of practice to be followed.	(1) page 55 (2) Ch. 17
3. The Designing and Engineering Cycle	Student will be able to redesign a park site in light of the fact of an unsatisfactory community park site design and requirements. Assemble a series of drawings into order with a stapler.	Instructor will explain to student the consideration to be given redesigning a site or structure	(1) page 55 (2) Ch. 18 (3) page 69

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
C. Selecting a Builder	Student will be able to list the types of contracts owner will consider in hiring a contractor. 1. Fixed price 2. Cost plus a fixed fee 3. Cost plus a percentage of cost 4. Incentive	Select an appropriate construction contract for a specific construction job and give reasons why it was selected.	(1) page 56 (2) Ch. 19 (3) page 72
1. Contracting	Student will be able to select a contractor and complete a contract form from one of three bidders.	Select a bidder. Complete a contract form. Answer questions related to bid selection and contract accuracy. Instructor will explain to students if they cannot understand instructions concerning signatures by contractors and witnesses.	(1) page 56 (2) Ch. 20 (3) page 74
2. Estimating and Bidding	Student will be able to suggest where a contractor of his estimator may get information concerning: 1. Size and kind of materials needed 2. Labor Costs 3. Equipment Cost 4. Overhead cost	Estimate whether a galvanized or a copper plumbing system will give the most profit considering a plan and costs. Become familiar with the terms and sequence of the managed production system of the "Big Builder" game. Compete against opponent players in bidding for construction jobs and	(1) page 56 (2) Ch. 21 (3) page 75

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		gaining the most profit. Estimate whether a brush or a roller will give you the most profit to you when painting a room.	
3. Scheduling	Student will be able to schedule a total of 12 hours time so as to complete a job of repairing a city sidewalk.	Using a bar chart and CPM chart, schedule the operations of a job according to the sequence in which they should occur and the time required using the bar chart technique. Schedule the deliveries of materials using the CPM chart.	(1) page 56-57 (2) Ch. 22 (3) page 79
4. Making Inspections	Students will be able to act as a building inspector and fill out a building inspector's card.	If possible, instructor should get city building inspector to come out and inspect structure. Complete the rough wiring in a structure, and note corrections needed. Inspect the plumbing in a structure, and note corrections needed.	(1) page 65 (2) Ch. 54 (3) page 167
5. Transferring the Project	Student will be able to play the role of a contractor and correct any deficiences.	Complete a punch-list form, a warranty form, and a release form.	(1) page 67 (2) Ch. 68 (3) page 211-213

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	REFERENCES
III. Applying Technology to People	A. Personnel Technology 1. Hiring 2. Training 3. Working 4. Advancing 5. Retiring Students will be able to relate the classifications of technology as applied to people in the categories of hiring, training, working, advancing and retiring.	Students, structured into groups of four or five, are given the opportunity to apply the management technology of organizing to people and things. Each group consists of a foreman, timekeeper, recorder, safety and grievance man, and equipment supervisor.	(1) page 51 (2) Ch. 5 (3) page 12
A. Working As a Contractor	Student will be able to make a decision and give reason concerning use of material other than specified.	Decide whether to use materials other than those specified or wait for the required material and pay a fine. From problems arising from the decisions made in the above, make two other decisions.	(1) page 57 (2) Ch. 23
B. Collective Bargaining	Student will be able to act as a union spokesman and negotiate contract agreements and disagreements.	Give reasons why a new contract is or is not necessary when the old one expires. Negotiate for contract acceptance. Instructor will divide class into two (2) groups and explain to the class the role each group should play.	(1) page 57 (2) Ch. 24 (3) page 83-84

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
C. Hiring Construction Personnel	Student will be able to act as worker and personnel manager.	Play the role of a personnel manager interviewing job applicants. Play the role of a job applicant. Instructor will monitor student activities.	(1) page 57 (2) Ch. 25 (3) page 85
D. Training and Educating for Construction	Student will be able to list some of the requirements for a good apprenticeship training program.	Indicate some of the requirements for a good apprenticeship training program. Find the name of a potential employer in a telephone directory.	(1) page 57-58 (2) Ch. 26
E. Working Conditions	Student will be able to write a set of rules governing working conditions in the shop.	Instructor should make suggestions as to what he thinks students can do to write a set of rules governing working conditions in the laboratory.	(1) page 58 (2) Ch. 28 (3) page 91
F. Advancing in Construction	Student will be able to list the time length of preparation for various occupations using occupational guide.	In a role-playing situation concerning a labor-management grievance, serve as a member of a grievance committee, and present the position for a satisfactory solution from the worker's viewpoint. Serve as a member of the grievance committee. Participate in a simulated collective bargaining session to work out a	(1) page 60 (2) Ch. 34 (3) page 108

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		solution to a grievance problem. Serve as a labor or management member of a grievance committee and present a position for a satisfactory solution of the problem. Participate in a simulated collective bargaining session.	
H. Mediating and Arbitrating	Student will be able to participate in a settlement of a labor dispute.	Participate in a jurisdictional dispute involving two crafts, as a mediator, an arbitrator, or a union representative.	(1) page 65 (2) Ch. 55 (3) page 169
I. Striking	Student will be able to act out part of a negotiator or member of a picket line in a labor-management dispute.	Participate as a negotiator, an observer, or a member of a picket line in a labor-management dispute and resulting strike.	(1) page 66 (2) Ch. 59 (3) page 182
IV. Construction Production Technology	Student will be able to classify production practices as to preprocessing, processing postprocessing.	Classify specific production practices as preprocessing, processing, or postprocessing. Classify specific processing practices as separating, forming or combining. Construct a site box.	(1) page 58 (2) Ch. 29 (3) page 94

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
A. Getting Ready to Build	Student will be able to identify and locate temporary construction facilities.	Locate buildings, water mains, telephone lines, roads, and property lines, using a site box and a construction site plan. Locate temporary facilities where they will be efficient. Instructor will make suggestions as to consideration to given in selecting temporary facilities.	(1) page 58 (2) Ch. 30 (3) page 98 (6) Sec. 8
1. Clearing the Site	Student will be able to list a practical procedure to be followed in clearing the site as to cost and salvage possibility of various materials.	Identify the practice and equipment used for clearing the site of obstacles which interfere with a proposed construction project. Instructor will explain the most efficient technique for disposing of site obstacles and determine the cost of clearing. Instructor will inform students of the factors to be considered in clearing with regard to salvageable material.	(1) page 59 (2) Ch. 31 (3) page 100-101 (6) Sec. 8
2. Locating the Structure	Student will be able to locate corners of a structure using string and batter boards.	Construct right angle batter boards to be used to locate a structure on a simulated building site. Locate the outside walls of a building by running lines to points on the batter boards. Locate the four	(1) page 59 (2) Ch. 32 (3) page 103

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		corners of a building by intersecting lines attached to batter boards.	
3. Earthmoving	Student will be able to calculate the amount of truckloads of soil needed to fill a 100 cubic year hole and most efficient and least expensive method of earthmoving.	Instructor will explain how to figure how many truckloads of soil are needed to fill a 100 cubic year hole with compacted soil. Using an efficiency chart, equipment costs, and a graph to determine acres moved per hour, determine the amount of earth per hour. Select the proper earthmoving equipment. Determine the equipment costs.	(1) page 59 (2) Ch. 33 (3) page 118-123
4. Stabilizing Earth and Structures	Student will be able to explain the reason for stabilizing the wall of an excavation and demonstrate use of braces and shoring.	Underpin a simulated structure during the excavation of an adjacent area. Indicate the practices of trimming and stablizing. Instructor should point out the hazards involved from cave-ins.	(1) page 60 (2) Ch. 35 (3) page 112
B. Classifying Structures	Student will be able to identify what parts of a structure constitutes substructure and superstructure.	Select and sketch a structure. Identify the substructure and superstructure.	(1) page 60 (2) Ch. 36 (3) page 115-120

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
1. Setting Foundations	Student will be able to demonstrate why structures need foundations and explain why different materials are used.	Determine what happens when a load is applied with and without a spread footing. Determine what happens to the bearing surface when a load is applied to a floating footing.	(1) page 60 (2) Ch. 37 (3) page 118-120 (6) Sec. 10
a. Building Forms	Student will be able to lay-out mark, saw and assemble the parts of a form.	Instructor will have students lay out mark, saw and assemble necessary equipment, supplies, and drawings for a footing form and column form. Instructor will observe student activity and answer any questions students may have.	(1) page 61 (2) Ch. 38 (3) p. 121-122 (6) Sec. 10
b. Setting Reinforcement	Student will be able to measure, mark cut, bend, seat, and tie reinforcing steel in the form.	Measure, mark, cut, bend, seat, and tie reinforcing steel in a column form requiring the setting or reinforcement.	(1) page 61 (2) Ch. 39 (3) page 123
c. Mixing Concrete	Student will be able to explain the materials involved in mixing of concrete and identify these materials.	State the proportions for a concrete mix. Tell what a slump test is and why it is important. Name the steps involved in mixing and placing concrete in a footing and column form.	(1) page 61 (2) Ch. 40 (3) page 124-126

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
d. Placing and Finishing Concrete	Student will be able to mix, rod, screed, float and finish concrete in a form.	Proportion, mix, test, place, rod, screed, and finish concrete to make a concrete footing.	(1) page 61 (2) Ch. 41 (3) page 127-128
e. Completing Foundations	Student will be able to explain curing process of concrete and demonstrate correct procedure.	State how long it takes for concrete to set and cure. State why concrete should be kept moist while curing.	(1) page 61 (2) Ch. 42 (3) page 129 (6) Sec. 10
2. Building a Superstructure	Student will be able to list several types of superstructures that are built above ground.	Instructor will give various examples of superstructures and types of material from which they are built.	(1) page 62 (2) Ch. 43 (3) page 131
a. Building Mass and Masonry Super-structures	Student will be able to mix mortar and follow the correct procedure for laying a concrete block wall.	Demonstration by instructor, Mix Mortar. Lay and level concrete block to build a bearing wall.	(1) page 62 (2) Ch. 44 (3) page 133 (5) Ch. 5 and 19
b. Erecting Steel Frames	Students will be able to assemble steel columns to the concrete footings and demonstrate ability in assembling full size material. Students will be able to relate safety factors involved in working.	Assemble steel columns to the concrete footings. Assemble brackets to the steel columns. Erect a steel frame. Demonstrate skill in assembly using a full-size material. Demonstrate skill in aligning by squaring, leveling, and plumbing the columns and beams of the steel frame.	(1) page 62 (2) Ch. 45 (3) page 134

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		Demonstrate the operation of a boom by operating, rigging, hoisting, and setting steel by use of hand signals.	
c. Erecting Concrete Frames	Students will be able to build form for concrete frames, columns, and beams.	Build forms for making concrete frames using the instructions, illustrations, and specifications. Construct, plumb and level shoring members. Instructor should emphasize safety practice in handling heavy concrete parts and steel. Remind students of injury that may result to legs or feet from dropping heavy objects.	(1) page 62 (2) Ch. 46 (3) page 140 (6) Sec. 10
d. Building Wood Frames	Students will be able to select stock, measure, mark, saw, and assemble the: 1. Rough floor 2. Sills 3. Bridging 4. Sub-floor 5. Lower Plate 6. Studs 7. Window Frame 8. Headers 9. Top Plate 10. Roof Trusses	Measure, mark, and saw materials to length and assemble the rough floor framing of a model structure Construct bridging in a wood floor and install the subfloor. Lay out the wall plates and studs of a wood frame floor structure; cut them to length; assemble the wall sections. Construct and install the window frame header, and double plates for a wood frame structure. Lay out, construct, and erect the roof trusses for a wood frame wall and floor	(1) page 63 (2) Ch. 47 (3) Page 145 (6) Sec. 11

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		structure. Inspect a completed frame structure and evaluate the findings.	
3. Installing Utilities	Student will be able to classify the various systems that are classified under the concept "utility systems."	Define the concept "utility systems" Point out examples of ducting, piping, and wiring in the school laboratory and in the home. Name specific utility plants in the community or nearby.	(1) page 63 (2) Ch. 48 (3) page 153
a. Installing Heating, Cooling, and Ventilating Systems	Student will be able to lay out, cut, drill and assemble ductwork with sheet metal screws. Student will be able to layout location of duct open in subfloor of model building.	Instructor will caution students to beware of cuts from sharp edges of metal. Lay out, cut, and bend three pieces of sheet metal to form a boot, boot cap, and round duct. Fasten together the ends of a formed boot with seam joints. Assemble ductwork with a dovetail joint and sheet metal screws. Lay out the location of the duct opening on the subfloor. Saw out the subfloor opening. Install the ductwork in the structure.	(1) page 63 (2) Ch. 49 (3) page 156
b. Installing Plumbing Systems	Student will lay out locations for plumbing lines and bore holes for installing lines. Student will be	Instructor will demonstrate the procedure used to lay out the locations for plumbing on a structure. Bore	(1) page 64 (2) Ch. 50 (3) page 158

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		holes for installing plumbing lines. Cut a pipe to a given length. Cut the threads on galvanized pipe. Assemble a pipe and fittings.	(7) Unit 21
c. Installing Piping Systems	Student will be able to cut and ream copper tubing and sweat solder a joint. Student will be able to secure tubing assembly and pipe assembly to the backing board.	Cut and ream copper tubing. Flux, assemble, and sweat-solder copper tubing and fittings. Instructor will point out safety procedure to be followed in using propane torch to avoid serious burn. Measure distance between the studs of a structure. Lay out and cut a backing board and nailer. Install the backing board nailer. Secure tubing assembly and the pipe assembly to the backing board. Complete the installation of the hot water and cold water lines in a structure.	(1) page 64 (2) Ch. 51 (3) page 160-161 (7) Unit 21
d. Installing Electrical Power Systems	Student will be able to lay out wiring and drill holes for the electrical system following safe and proper procedures while installing outlet boxes.	Lay out the wiring run for the electrical wiring system. Drill holes as marked for the electrical system, following safe and proper procedures. Install electrical outlet boxes.	(1) page 64 (2) Ch. 52 (3) page 164 (6) Sec. 14

COURSE: CONSTRUCTION

TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
e. Installing Electrical Communications	Student will be able to prepare, and install conduit armored cable and nonmetallic sheath cable (romex) in a structure.	Prepare and install thinwall conduit, flexible armored cable, nonmetallic sheathed cable in a structure. Instructor will demonstrate correct procedure for bending conduit and stripping insulation from nonmetallic cable (romex).	(1) page 64 (2) Ch. 53 (3) page 165 (6) Sec. 14
4. Enclosing Framed Superstructures	Student will be able to name types of materials used to enclose the following parts of superstructures. 1. Roofs 2. Exterior Walls 3. Floors 4. Ceilings 5. Partitions 6. Exterior walls 7. Insulation	Prepare and install the wall sheathing on a structure.	(1) page 65 (2) Ch. 56 (3) page 172
a. Roofing	Student will be able to list types of roofs and advantages and disadvantages of each.	Nail roof sheathing to the upper chords (rafters). Measure, cut, and apply building felt with a staple gun.	(1) page 66 (2) Ch. 57 (3) Page 174 (6) Sect. 11

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TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
b. Enclosing Exterior Walls	Students will be able to list several types of materials used to enclose exterior walls and apply felt to the exterior wall of a structure, and install flashing and a window frame unit in a structure.	Apply building felt to the exterior wall of a structure. Locate and install a corner board on a structure. Lay out, cut, and install vertical siding on the gable end of a structure. Install a soffit. Measure, cut, and install return fascia and rake. Install a window frame unit in the structure. Bend flashing and install it over the window.	(1) page 66 (2) Ch. 58 (3) page 179 (6) Sec. 11
c. Insulating	Student will be able to list reasons for insulating, type of material used and method of applying.	Instructor will demonstrate the proper method used to measure, cut, and install blanket insulation. Instructor will caution students of safety practices to be followed when using staple gun and installing fiber glass.	(1) page 66 (2) Ch. 60 (3) page 188
d. Applying Wall Materials	Student will be able to measure, cut, and install drywall board by using joint cement and tape. Student will demonstrate correct procedures for applying plaster to a simulated wall section.	Measure, cut, and install gymsum board to cover the long wall of the structure. Apply joint cement and joint tape to an interior wall surface. Sand over a first coat of joint cement and apply a second coat. Scribe, cut, fit, and install paneling.	(1) page 67 (2) Ch. 61 (3) page 191-194 (6) Sec. 11

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TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
		Mix and apply a brown coat of plaster to a simulated wall section. Instructor will demonstrate procedure for taping and floating dry wall and mixing and applying plaster.	
e. Applying Ceiling Materials	Student will be able to select the correct type of ceiling to be installed based on type of construction involved.	Measure, cut, and install furring strips and ceiling tile.	(1) page 67 (2) Ch. 62 (3) page 196
f. Laying Floors	Student will be able to identify various floor covering materials and be able to install floor tile.	Instructor will demonstrate correct procedure for laying out, applying mastic and installing vinyl tile. Instructor will remind students of necessity of proper ventilation with substances to install tile.	(1) page 67 (2) Ch. 63 (3) page 197
5. Finishing the Project	Student will be able to measure, cut, (miter or cope) molding and properly install using nail set.	Install an interior window casing. Install baseboard, base shoe, and cove molding. Instructor will demonstrate correct method of measuring and cutting molding.	(1) page 67 (2) Ch. 64 (3) page 199 - 202
a. Painting and Decorating	Student will be able to list various coating used and explain why different paints must be used for	Explain in what ways the specifications for paint used to line highways differ from the specifications for	(1) page 68 (2) Ch. 65 (3) page 202

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TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
	different jobs. Students will be able to demonstrate his ability to apply paint using brush or roller.	paint used on your walls or woodwork at home. List what fixtures or accessories would need to be installed on a new school playground a and new football field with trace and field facilities. Apply paint to exterior and interior surfaces.	
b. Installing Accessories	Students will be able to strip insulation, twist wires together, and make soderless connections and push wire into outlet boxes.	Follow proper procedures in installing a duplex convenience outlet, a procelain lamp receptacle, and a toggle switch to complete a grounded system in the structure. Connect a grounded (3-prong) male plug to the electrical system.	(1) page 68 (2) Ch. 66 (3) page 205-206
6. Completing the Site	Student will be able to list the operations involved in completing the site such as installation of sidewalks, planting of trees and fences.	Prepare soil and properly plant a tree, shrub, or other plant appropriate to your area.	(1) page 68 (2) Ch. 67 (3) page 207-210
7. Servicing Property	Student will be able to relate the activities included in servicing and post processing of property.	Perform needed servicing activities on a structure as determined by a prior inspection.	(1) page 68 (2) Ch. 69 (3) page 214-215

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TOPIC OUTLINE	PERFORMANCE OBJECTIVES	SUGGESTED ACTIVITIES	RESOURCES
8. Salvaging	Students will be able to follow the procedure listed in salvaging with emphasis on saving all reusable material. 1. Glass 2. Electrical Fixtures 3. Trim 4. Horizontal Siding 5. Roofing 6. Building Felt 7. Vertical Siding 8. Sheathing 9. Paneling 10. Plumbing 11. Electrical Wiring 12. Roof 13. Wall Framing 14. Ductwork 15. Floor 16. Subfloor	Instructor will demonstrate, discuss review and test students concerning the following hazards to avoid when conducting salvage procedure. 1. Glass 2. Nails 3. Splinters 4. Burrs on pipe and sheetmetal.	

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Resource Materials

The following list of resource materials are by no means complete or exhaustive. They merely represent a compliation of the best and most available materials known and used by the members of the committee.

1. Industrial Technology. Curriculum Guide Unified School District 259. Wichita, Kansas.

2. Lux, Donald G., Willis E. Ray, and A. Dean Hauenstein. "The World of Construction." Bloomington, Illinois: McKnight and McKnight Publishing Company. 1970.

3. The World of Construction. Teacher's Guide. Donald F. Lux, Willis E. Ray, and A. Dean Hauenstein. Bloomington, Illinois: McKnight and McKnight Publishing Company. 1970.

4. The World of Construction. Laboratory Manual. Donald G. Lux, Willis E. Ray, and A. Dean Hauenstein. Bloomington, Illinois: McKnight and McKnight Publishing Company. 1970.

5. J. Edgar Ray. The Art of Bricklaying. Third Edition. Peoria, Illinois: Charles A. Bennett Publishers.

6. Paul Wallach and Donald E. Hepler. Architecture Drafting and Design. Second Edition. New York: McGraw-Hill Publishing Company.

7. Woodin, James C., and Louis E. Hayes. Home and Building Maintenance. Bloomington, Illinois: McKnight and McKnight Publishing Company, 1969.

Note: The entries in this section are numbered for the purpose of reference. The numbers listed here correspond to the numbers in parentheses located within the text of this publication in section entitled "Resource Materials."

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